

Remarks

Claims 1-30 are pending in this application. Claims 1-3, 5, 7, 10, 11-12, 14, 20, 24, 26 and 29-30 have been amended. Support for the amendments to claims 1, 3, 10, 14 and 20 may be found throughout the specification. No new matter is added. After entry of this Amendment, claims 1-30 will remain pending in the patent application. In view of the foregoing amendments and the following remarks, reconsideration and allowance of all the rejected claims are requested.

Information Disclosure Statement

Applicants thank the Examiner for considering the references submitted on March 11 and March 31, 2004, as evidenced by the signed and initialed Forms PTO-1449. The Examiner indicated that the Information Disclosure Statement (IDS) filed on March 14, 2005 fails to comply with 37 CFR 1.98(a)(2). In response, Applicants note that an IDS was filed on March 11, 2005, not on March 14, 2005. Furthermore, Applicants respectfully submit that an English Abstract of each foreign reference cited in Form PTO-1449 was submitted with the IDS of March 11, 2005. Per MPEP 609-III-A(3), submission of an English language abstract of a reference may fulfill the requirement for a concise explanation. Accordingly, Applicants respectfully request the Examiner to consider the information contained in these foreign references.

The Examiner also indicated that a copy of the European Search Report was not found in the file. Applicants respectfully note that a copy of the European Search Report was submitted along with the Information Disclosure Statement dated March 31, 2004. A copy of the stamped Filing Receipt dated March 31, 2004 indicating that the foreign search report was duly submitted to the PTO is enclosed herewith. Applicants also enclose a copy of the Information Disclosure Statement and form PTO-1449 filed on March 31, 2004, which cites the European Search Report. Applicants respectfully request that the Examiner return an initialed copy of the form PTO-1449 in the next communication showing that the European Search Report has been considered.

Claim Objections

In the Office Action, claim 3 was objected to. In connection with the objection, the Examiner indicated that the language “one go” was unclear. In response, claim 3 is amended to positively recite that the sensor is configured to measure the at least one of tilt and height along the edge contour of the substrate during a same operation. It is respectfully submitted that the amendment to claim 3 addresses the objection fully. Accordingly, reconsideration and withdrawal of the objection to claim 3 is respectfully requested.

Rejection Under 37 U.S.C. § 102

Claims 1-3, 6-17 and 19-30 are rejected under 35 U.S.C. § 102(b) as being anticipated by Fujimoto (USP 6,245,585). Applicants respectfully traverse this rejection on the following basis.

As a preliminary matter, per MPEP §707.07(d), Applicants note that a plurality of claims should never be grouped together in a common rejection, unless that rejection is equally applicable to all claims in the group. As this application contains 6 independent claims and 24 dependent claims directed to different embodiments of the invention, Applicants point out that the rejection in the Office Action is not equally applicable to claims 1-3, 6-17 and 19-30. Therefore, the Office Action is not complete as to all matters because the Examiner has not clearly identified a ground of rejection for each rejected claim. Accordingly, in the event the rejections of some or all of the pending claims are maintained, the Examiner is respectfully requested to provide in the next Office Action specific reasons as to why each rejected claim is not patentable over the cited art. If, for example, the current rejections are maintained, Applicants respectfully submit that claims 3, 8, 12, 13, 19, 20, 21, 27 and 28 are in condition for allowance since no specific grounds for rejection have been provided.

Turning now to the claim rejection, Applicants respectfully submit that claim 1 is patentable over Fujimoto at least because this claim recites an assembly for determining at least one of tilt and height of a surface of a substrate in a lithographic apparatus, wherein, *inter alia*, the at least one path of the substrate is at least partly inclined with respect to both an exposure scanning direction and a direction that is substantially perpendicular to said

scanning direction of said lithographic apparatus. Fujimoto does not disclose, teach or suggest an assembly including these features.

Fujimoto discloses an adjustment method and an apparatus for precisely aligning the surface of the wafer and precisely bringing the wafer surface to the focal point of the impinging light. (*See* col. 1, lines 42-46). Fujimoto discloses that the apparatus includes a laser source 130 that projects a set of five laser beams at an angle to the surface of a cell of the wafer 109 and a photodetector 131 mounted on a position opposite to the laser source 130 to detect light beams reflecting off the wafer surface. (*See* col. 4, lines 40-60). Fujimoto discloses that the measurement data are stored in a sequence controller 140. (*See* col. 4, lines 52-55).

However, unlike the invention of claim 1, Fujimoto fails to disclose, teach or suggest that the at least one path of the substrate along which tilt and/or height measurements are performed is at least partly inclined with respect to both an exposure scanning direction and a direction that is substantially perpendicular to the scanning direction of the lithographic apparatus. Fujimoto merely discloses that the laser source 130 and the photodetector 131 perform measurements along a path perpendicular to the scanning direction of the lithographic apparatus. Specifically, Fujimoto discloses that the height/tilt measurement path 401 includes columns arranged in the x-direction and that the scanning direction is oriented along the y-axis. (*See* col. 5, lines 5-8, col. 6, lines 18-25 and FIG. 4A). As such, Fujimoto does not disclose, teach or suggest each and every feature recited by claim 1 and, as a result, cannot anticipate claim 1.

The Examiner indicated that Fujimoto discloses at col. 5, lines 21-67 and col. 6, lines 1-17 and in FIG. 3 that the at least one path is partly inclined with respect to an exposure scanning direction. Applicants respectfully disagree and note that Fujimoto merely describes in this excerpt that the substrate may be tilted in order to place the surface of the substrate in a plane substantially parallel to the horizontal plane. However, there is no teaching or disclosure related to an at least one path along which tilt and/or height measurements are performed that is partly inclined with respect to an exposure scanning direction.

Claims 2-3 and 6-9 are patentable over Fujimoto at least by virtue of their dependency from claim 1 and for the additional features recited therein.

Claim 10 is patentable over Fujimoto for at least similar reasons as provided in claim 1 and for the additional features recited therein. Namely, claim 10 is patentable over Fujimoto at least because this claim recites a lithographic apparatus wherein, *inter alia*, the at least one path of the substrate is at least partly inclined with respect to both an exposure scanning direction and a direction that is substantially perpendicular to said scanning direction of said lithographic projection apparatus. As mentioned previously, Fujimoto does not disclose, teach or suggest these features. Therefore, Fujimoto does not disclose, teach or suggest each and every feature recited by claim 10 and, as a result, cannot anticipate claim 10.

Claims 11-13 are patentable over Fujimoto at least by virtue of their dependency from claim 10 and for the additional features recited therein.

Claim 14 is patentable over Fujimoto for at least similar reasons as provided in claim 1 and for the additional features recited therein. Namely, claim 14 is patentable over Fujimoto at least because this claim recites a method for determining at least one of tilt and height of a surface of a substrate in a lithographic projection apparatus, wherein, *inter alia*, the at least one path of said substrate is at least partially inclined with respect to both an exposure scanning direction and a direction that is substantially perpendicular to said scanning direction of said lithographic projection apparatus. As mentioned previously, Fujimoto does not disclose, teach or suggest these features. Therefore, Fujimoto does not disclose, teach or suggest each and every feature recited by claim 14 and, as a result, cannot anticipate claim 14.

Claims 15-17 and 19 are patentable over Fujimoto at least by virtue of their dependency from claim 14 and for the additional features recited therein.

Claim 20 is patentable over Fujimoto for at least similar reasons as provided in claim 1 and for the additional features recited therein. Namely, claim 20 is patentable over Fujimoto at least because this claim recites an assembly for determining at least one of tilt and height of a surface of a substrate in a lithographic apparatus, wherein the sensor is configured to measure the at least one of tilt and height with a predetermined subset of the plurality of sensing spots when one or more sensing spots are directed on or outside an edge contour of the substrate. Fujimoto does not disclose, teach or suggest these features.

In Fujimoto, unlike the invention of claim 20, there is no tilt/height measurements when the sensing spots are on the edge of the substrate. (*See* col. 6, lines 48-53). Fujimoto

merely discloses that the leveling is provided by using tilt angle data stored in the memory when the measurement cell is near the substrate periphery and that tilt/height measurements with laser beams are performed when the current cell is not located near the substrate periphery. (See col. 6, lines 54-67). Therefore, Fujimoto does not teach or suggest each and every feature recited by claim 20 and, as a result, cannot anticipate claim 20.

Claim 21 is patentable over Fujimoto at least because this claim recites an assembly for determining at least one of tilt and height of a surface of a substrate in a lithographic apparatus, wherein, *inter alia*, a direction of each of the at least two paths of the substrate is substantially parallel to a direction of a local tangent to a part of an edge contour of the substrate proximate to the path, and wherein the at least two paths are contiguous and are at least partly inclined with respect to each other. Fujimoto does not disclose, teach or suggest these features.

In Fujimoto, unlike the invention of claim 21, when a direction of each of at least two tilt/height measurement paths of the substrate is substantially parallel to a direction of a local tangent to a part of an edge contour of the substrate proximate to the path, the at least two tilt/height measurement paths are not contiguous. (See FIG. 4A). As can be seen in FIG. 4A, the only two tilt/height measurement paths that each have a direction substantially parallel to a direction of a local tangent to a part of an edge contour of the substrate proximate to the path, are the paths represented by the columns on the far right and far left of the wafer. However, these paths are not contiguous. Therefore, Fujimoto does not teach or suggest each and every feature recited by claim 21 and, as a result, cannot anticipate claim 21.

Claims 22-24 are patentable over Fujimoto at least by virtue of their dependency from claim 21 and for the additional features recited therein.

Claim 25 is patentable over Fujimoto at least because this claim recites a lithographic apparatus wherein, *inter alia*, movement of the substrate table from each of the at least three positions to a subsequent position includes movement along both a first axis substantially parallel to the exposure scanning direction and a second axis substantially parallel to the surface of the substrate and orthogonal to the first axis. Fujimoto does not teach or suggest these features.

In contrast to the invention of claim 25, in Fujimoto, the movement of the substrate table from one tilt/height measurement position to a subsequent position is merely along a

direction perpendicular to a scanning direction or along the scanning direction. (*See* FIG. 4A). Therefore, Fujimoto does not disclose, teach or suggest each and every feature recited by claim 25 and, as a result, cannot anticipate claim 25.

Claims 26-30 are patentable over Fujimoto at least by virtue of their dependency from claim 25 and for the additional features recited therein.

Accordingly, reconsideration and withdrawal of the rejection of claims 1-3, 6-17 and 19-30 under 35 U.S.C. § 102(b) as being anticipated by Fujimoto are respectfully requested.

Claims 1-30 are rejected under 35 U.S.C. § 102(a) as being anticipated by Wakamoto (2003/0058423). Applicants respectfully traverse this rejection on the following basis.

As mentioned previously, per MPEP §707.07(d), Applicants note that a plurality of claims should never be grouped together in a common rejection, unless that rejection is equally applicable to all claims in the group. Applicants respectfully submit that the Office Action is not complete as to all matters because the Examiner has not clearly identified a ground of rejection for each rejected claim. Accordingly, in the event the rejection of some or all of the pending claims is maintained, the Examiner is respectfully requested to provide in the next Office Action specific reasons as to why each rejected claim is not patentable over the cited art. If, for example, the current rejections are maintained, Applicants respectfully submit that claims 3, 8, 12, 13, 19, 20, 21, 27 and 28 are in condition for allowance since no specific grounds for rejection have been provided.

Claim 1 is patentable over Wakamoto at least because this claim recites an assembly for determining at least one of tilt and height of a surface of a substrate in a lithographic apparatus, wherein, *inter alia*, the at least one path of the substrate is at least partly inclined with respect to both an exposure scanning direction and a direction that is substantially perpendicular to said scanning direction of said lithographic apparatus. Wakamoto does not disclose, teach or suggest an assembly including these features.

Wakamoto merely discloses a step and scan apparatus including an inclined incidence type AF sensor 45 for bringing the surface of the wafer 14 on the Z-tilted stage 19 in register with the optimal image plane of the projection optical system 13. (*See* paragraph [0080]-[0081]). Wakamoto discloses that the sensor 45 includes a light projector 40 and a light receiver 42. *Id.*

However, unlike the invention of claim 1, the tilt/height measurement path of the substrate in Wakamoto is not at least partly inclined with respect to an exposure scanning direction and with a direction substantially perpendicular to said scanning direction of said lithographic apparatus. Wakamoto merely discloses that the measurement path is oriented along a direction parallel to the scanning direction. (See paragraph [0082] and FIGS. 3A, 4A-7C). Specifically, Wakamoto states that “this posture control is performed synchronously with the scanning exposure.” (See paragraph [0082]). Therefore, Wakamoto does not disclose, teach or suggest each and every feature recited by claim 1 and, as a result, cannot anticipate claim 1.

Claims 2-3 and 6-9 are patentable over Fujimoto at least by virtue of their dependency from claim 1 and for the additional features recited therein.

Claim 10 is patentable over Wakamoto for at least similar reasons as provided in claim 1 and for the additional features recited therein. Namely, claim 10 is patentable over Wakamoto at least because this claim recites a lithographic apparatus wherein, *inter alia*, the at least one path of the substrate is at least partly inclined with respect to both an exposure scanning direction and a direction that is substantially perpendicular to said scanning direction of said lithographic projection apparatus. As mentioned previously, Wakamoto does not disclose, teach or suggest these features. Therefore, Wakamoto does not disclose, teach or suggest each and every feature recited by claim 10 and, as a result, cannot anticipate claim 10.

Claims 11-13 are patentable over Wakamoto at least by virtue of their dependency from claim 10 and for the additional features recited therein.

Claim 14 is patentable over Wakamoto for at least similar reasons as provided in claim 1 and for the additional features recited therein. Namely, claim 14 is patentable over Wakamoto at least because this claim recites a method for determining at least one of tilt and height of a surface of a substrate in a lithographic projection apparatus, wherein, *inter alia*, the at least one path of said substrate is at least partially inclined with respect to both an exposure scanning direction and a direction that is substantially perpendicular to said scanning direction of said lithographic projection apparatus. As mentioned previously, Wakamoto does not disclose, teach or suggest these features. Therefore, Wakamoto does

not disclose, teach or suggest each and every feature recited by claim 14 and, as a result, cannot anticipate claim 14.

Claims 15-17 and 19 are patentable over Wakamoto at least by virtue of their dependency from claim 14 and for the additional features recited therein.

Claim 20 is patentable over Wakamoto for at least similar reasons as provided in claim 1 and for the additional features recited therein. Namely, claim 20 is patentable over Wakamoto at least because this claim recites an assembly for determining at least one of tilt and height of a surface of a substrate in a lithographic apparatus, wherein the at least one path of the substrate is at least partially inclined with respect to an exposure scanning direction of the lithographic projection apparatus. As mentioned previously, Wakamoto does not disclose, teach or suggest that the tilt/height measurement path is at least partially inclined with respect to an exposure scanning direction of the lithographic projection apparatus. Therefore, Wakamoto does not disclose, teach or suggest each and every feature recited by claim 20 and, as a result, cannot anticipate claim 20.

Claim 21 is patentable over Wakamoto at least because this claim recites an assembly for determining at least one of tilt and height of a surface of a substrate in a lithographic apparatus, wherein, *inter alia*, a direction of each of the at least two paths of the substrate is substantially parallel to a direction of a local tangent to a part of an edge contour of the substrate proximate to the path, and wherein the at least two paths are contiguous and are at least partly inclined with respect to each other. Wakamoto does not disclose, teach or suggest these features.

In Wakamoto, the direction of the measurement paths is parallel to the scanning direction. Therefore, the at least two measurements paths cannot be inclined with respect to each other.

Furthermore, when a direction of each of at least two measurement paths of the substrate is substantially parallel to a direction of a local tangent to a part of an edge contour of the substrate proximate to the path, the at least two paths are not contiguous. It is noted that the only measurement paths that would satisfy this condition would be those positioned on opposite sides of the surface of the substrate, since the measurement paths follow the scanning direction. However, these measurement paths are not contiguous. Therefore,

Wakamoto does not disclose, teach or suggest each and every feature recited by claim 21 and, as a result, cannot anticipate claim 21.

Claims 22-24 are patentable over Wakamoto at least by virtue of their dependency from claim 21 and for the additional features recited therein.

Claim 25 is patentable over Wakamoto at least because this claim recites a lithographic apparatus wherein, *inter alia*, movement of the substrate table from each of the at least three positions to a subsequent position includes movement along both a first axis substantially parallel to the exposure scanning direction and a second axis substantially parallel to the surface of the substrate and orthogonal to the first axis. Wakamoto does not teach or suggest these features.

As mentioned previously, in Wakamoto, the measurement paths follow the scanning direction, which is oriented along a single direction. Therefore, in Wakamoto, a movement of the substrate table from a position to a subsequent position does not include movement along both a first axis substantially parallel to the exposure scanning direction and a second axis substantially parallel to the surface of the substrate and orthogonal to the first axis.

Claims 26-30 are patentable over Wakamoto at least by virtue of their dependency from claim 25 and for the additional features recited therein.

Accordingly, reconsideration and withdrawal of the rejection of claims 1-30 under 35 U.S.C. § 102(a) as being anticipated by Wakamoto are respectfully requested.

Having addressed the foregoing rejections, it is respectfully submitted that a full and complete response has been made to the outstanding Office Action and, as such, the application is in condition for allowance. A Notice to that effect is respectfully requested.


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Reply and Amendment Under 37 C.F.R. §1.111

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

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Respectfully submitted,



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